C L A I M S

What is claimed is:

1. A system for directly measuring a magnetostriction value of a magnetoresistive element, the system comprising:
a fixture for receiving a substrate carrying one or more magnetoresistive elements;
a magnet assembly for applying a first magnetic field parallel to the substrate, and for applying a magnetic alternating field perpendicular to the substrate and parallel to magnetoresistive layers of the elements;
a mechanism for applying a mechanical stress to the substrate, the stress being oriented parallel to the substrate; and
a measuring subsystem for measuring a signal from at least one of the magnetoresistive elements.

2. A system according to claim 1, wherein the substrate is a row or a wafer.

3. A system according to claim 2, wherein the row or wafer carries a plurality of the magnetoresistive elements.

4. A system according to claim 1, wherein the first magnetic field is a DC field.

5. A system according to claim 1, wherein the measuring subsystem is locked to a frequency of the alternating field.

6. A system according to claim 1, wherein the signal from the at least one of the magnetoresistive elements is measured before the mechanical stress is applied; wherein, after applying the mechanical stress, the first magnetic field is changed until the signal being measured co-currently thereto about matches the signal measured before applying the mechanical stress.

7. A system according to claim 1, wherein the mechanism for applying the mechanical stress causes the substrate to bend.

8. A system according to claim 7, wherein the mechanism for applying the mechanical stress is a micrometer screw.

9. A system according to claim 8, wherein the micrometer screw is electronically controlled.

10. A system according to claim 1, wherein the mechanism for applying the mechanical stress is a heat source.

11. A system according to claim 1, wherein the mechanism for applying the mechanical stress is a piezo layer.

12. A system according to claim 1, further comprising a controller for changing the first magnetic field.

13. A system according to claim 12, further comprising a computing device for calculating a magnetostriction constant of the at least one magnetoresistive element based in part on a change of mechanical stress anisotropy due to application of the mechanical stress and the change in the first magnetic field.

14. A system according to claim 1, wherein the at least one magnetoresistive element includes shielding layers, wherein the first magnetic field is calibrated to reflect an influence of a demagnetizing effect of the shielding layers on the element.

15. A system according to claim 1, wherein the magnetoresistive element is an Anisotropic Magnetoresistance (AMR)-, Giant Magnetoresistance (GMR)- or Tunneling Magnetoresistance (TMR)-based sensor.

16. A system according to claim 1, wherein the magnetoresistive elements are magnetic memory elements.

17. A system for directly measuring a magnetostriction value of a magnetoresistive element, the system comprising:
a bending fixture for receiving a substrate carrying one or more magnetoresistive elements;
a magnet assembly for applying a magnetic direct current (DC) field parallel to the substrate, and

for applying a magnetic alternating field perpendicular to the substrate and parallel to magnetoresistive layers of the elements;

a mechanism for applying a mechanical stress to the substrate by bending the substrate, the stress being oriented parallel to the substrate;

a control circuit for changing the DC magnetic field; and

a measuring subsystem for measuring a signal from at least one of the magnetoresistive elements prior to application of the mechanical stress, after application of the mechanical stress, and during a time period when the DC magnetic field is changed.

18. A system for directly measuring a magnetostriction value of a magnetoresistive element, the system comprising:

a bending fixture for receiving a substrate carrying one or more magnetoresistive elements;

a magnet assembly for applying a magnetic direct current (DC) field parallel to the substrate, and for applying a magnetic alternating field perpendicular to the substrate and parallel to magnetoresistive layers of the elements;

a DC power supply for providing power to the magnet assembly;

an alternating current (AC) power supply for providing power to the magnet assembly;

a mechanism for applying a mechanical stress to the substrate by bending the substrate, the stress being oriented parallel to the substrate;

a measuring subsystem for measuring a signal from at least one of the magnetoresistive elements prior to application of the mechanical stress, after application of the mechanical stress, and during a time period when the DC magnetic field is changed;

a control circuit for changing the DC magnetic field until the signal currently being measured by the measuring subsystem about matches a signal measured before applying the mechanical stress; and

a computing device for calculating a magnetostriction constant of the at least one magnetoresistive element based in part on a change of mechanical stress anisotropy due to application of the mechanical stress and the change in the DC magnetic field.

19. A method for directly measuring a magnetostriction value of a magnetoresistive element, the method comprising:

providing a substrate carrying one or more magnetoresistive elements;

placing the substrate on a fixture;

applying a first magnetic field parallel to the substrate;

applying a magnetic alternating field perpendicular to the substrate and parallel to magnetoresistive layers of the elements;

measuring a signal from the element;

applying a mechanical stress to the substrate, the stress being oriented parallel to the substrate; and

changing the first magnetic field until the signal currently being measured about matches a signal measured before applying the mechanical stress.

20. A method according to claim 19, wherein the substrate is a row or a wafer.

21. A method according to claim 20, wherein the row or wafer carries a plurality of the magnetoresistive elements.

22. A system according to claim 19, wherein the mechanical stress causes the substrate to bend.

23. A method according to claim 22, wherein the mechanical stress is applied by a micrometer screw.

24. A method according to claim 19, wherein the magnetoresistive element is an Anisotropic Magnetoresistance (AMR)-, Giant Magnetoresistance (GMR)- or Tunneling Magnetoresistance (TMR)-based sensor.

25. A method for directly measuring a magnetostriction value of a magnetoresistive element, the method comprising:

providing a substrate carrying one or more magnetoresistive elements;

placing the substrate on a bending fixture;

applying a magnetic DC field parallel to the substrate;

applying a magnetic alternating field perpendicular to the substrate and parallel to magnetoresistive layers of the elements;

measuring a signal from at least one element;

applying a mechanical stress to the substrate by bending the substrate, the stress being oriented parallel to the substrate;

changing the magnetic DC field until the signal currently being measured about matches a signal measured before applying the mechanical stress; and

calculating a magnetostriction value of the element.